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INSTITUT INTERNATIONAL DU FROID
INTERNATIONAL INSTITUTE OF REFRIGERATION
177, boulevard Malesherbes, F-75017 PARIS

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STORAGE OF FRESH FRUITS AND BERRIES AT VARIOUS TEMPERATURES IN CONTROLLED ATMOSPHERE

V.M. MAICHENKO, G.S. GAIDAI, N.M. OSOKINA, A.V. MELNIK

Agricultural Institute, Uman, USSR

Unlike the pip fruits which are apt to be stored for rather long length of time, harvested plums and black currant can be stored for only two or three weeks. Owing to their biological properties plums and black currant belong to the fruits with very low maturability. Because of this, for the purpose of long-term storage, fruits of these crops are harvested at the stage of commercial maturity, i.e. when they are fully shaped and have their peculiar size, colour and palatability. To prolong the period of plum and black currant storage quite a number of methods is used. Among other things, the fruits are treated with various kinds of chemical compounds, physical factors and also wrapped in polymer materials. However, through this or that reason, none of the mentioned methods has found wide application.

In this connection the Department of fruits and vegetables storage and processing technology instituted an investigation to study the effect of controlled atmosphere (CA) under various temperature conditions on the storage time and commercial properties of fruits. The following varieties were taken for investigation: plums - Hungarian ordinary, Hungarian ajanskaya; black currant - Sanders, Goliath, Yunnat; apples - Calville, Cortland, Jonathan, Delicious.

Plums were gathered holding on the fruit-stems to preserve their wax layer, black currants were picked up in clusters. Righ after being picked up the fruits were placed in containers for subsequent storage. The experiments were run under three temperature conditions and in several gaseous atmospheres. The results for plum and black currant storage are given only for variants of the gaseous atmosphere optimum composition, while those for apples - in two atmospheres being investigated. The fruits stored under similar temperature conditions but in normal atmospheric environment (CO_2 - 0.03%; O_2 - 21%) served as control speciments.

The storage time and fruits quality are dependent on the environment where the products get into after harvesting. The better of the environmental conditions suit biological features of the species and variety of the products the more efficiently and longer alimentary qualities of the fruits can be maintained. The index of post-storage marketable product output is an important criterion for evaluating the efficiency of the proposed method of fruits storage.

The investigations suggest that the storage technology of the fruits with poor post-harvesting maturability requires maintaining rather rigid temperature conditions (somewhat above the freezing point for tissues) but keeping them from being frozen. In this case the gaseous atmosphere composition should be optimum.

The studies have attested to the possibility of storing fresh plums and black currants in controlled atmosphere at temperatures in the neighbourhood of -2°C.

Basing on the results obtained for assessment of the effect of temperature conditions on keeping quality of fresh plums in normal atmospheric environment it was found that the difference in the marketable product output between the temperature variants of +2 and

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quality of late-maturation apples of the Cortland variety. Gaseous atmosphere with the 6% CO_2 and 3% O_2 content combined with a temperature of +3°C have proved to be the best of the investigated storage conditions and offer a 27.3 per cent gain over the control variant in the marketable product output concurrently with a decrease in the mass natural losses by 2.8 times.

TABLE 11

Results of black currant storage
(average for a 3-year period)

Pomologic variety	Storage conditions*		Storage time, days	Marketable product output, %	Mass natural losses, %
	Temperature, °C	Atmosphere composition $\%CO_2+\%O_2$			
Yunnat	+2	Control	16	92.0	7.5
		CA 11+10	56	92.6	2.3
	0	Control	28	92.8	5.7
		CA 11+10	58	92.6	2.0
	-2	Control	33	93.5	5.4
		CA 11+10	124	93.5	1.7
Sanders	+2	Control	22	92.1	8.0
		CA 11+10	63	92.2	2.5
	0	Control	36	92.0	8.2
		CA 11+10	113	92.6	2.8
	-2	Control	42	92.8	7.4
		CA 11+10	147	92.8	3.1
Goliath	+2	Control	22	92.0	8.2
		CA 11+10	63	86.3	2.4
	0	Control	36	92.6	7.7
		CA 11+10	113	92.1	3.0
	-2	Control	42	93.4	7.3
		CA 11+10	147	92.6	3.3

Some decrease in the output of marketable apples of the same variety was observed at 0°C in the 3% CO_2 and 3% O_2 - containing atmosphere. Under these conditions the product output increased by 22.5 per cent as compared to the ordinary storage, but no considerable decrease in the mass losses was observed. The use of higher concentration carbon dioxide (CA 6+3) in combination with a temperature of 0°C reduces the gain in the marketable fruit output to a minimum (1.9 per cent).

Proceeding from the results presented in Table 111, the storage of late-maturation apples of the Delicious variety in controlled atmosphere has no substantial advantages over the ordinary storage. It is significant that the fruits of this variety, when stored in normal atmosphere, have only minor losses over the whole temperature range being investigated. However, the exposure to a subzero temperature of -1.5°C makes it possible to decrease the mass natural o losses of apples by 4.7 times.

So, a temperature of +3°C and controlled atmosphere containing

The results of the investigation reveal that the intensity of respiration in the fruits stored in controlled atmosphere is considerably lowered and, consequently, ripening and over-ripening processes slow down. As a result, the storage time increases, the marketable product output is stepped up and the constituents of the chemical composition are better preserved.

ETUDE DE LA CONSERVATION DES FRUITS FRAIS ET DES BAIES A DES TEMPERATURES DIFFERENTES EN ATMOSPHERE CONTROLEE

RESUME : La température optimale de conservation des prunes et des cassis frais est de -1.5 à 2°C. Dans les conditions mentionnées ci-dessus en combinaison avec l'atmosphère contrôlée la durée de conservation des prunes était jusqu'à 125 jours. La durée de conservation du cassis à la température analogue en milieu gazeux était de l'ordre de 106-110 jours, tandis que la durée pour l'échantillon témoin était 30-46 jours. On a constaté que pour la conservation des pommes Cortland le régime optimal était le suivant : température de + 3°C et atmoshpère contrôlée contenant 6 % de CO_2 et 3 % d'O_2 ; pour les pommes Delicious - entre 0 et -1.5°C, en atmosphère ordinaire. Pour les pommes Jonathan on recommande + 3°C et l'atmosphère contenant 3 % de CO_2 et 3 % d'O_2. Les mêmes conditions sont recommandées pour la variété Calville.